IOWA HIGHWAY RESEARCH BOARD (IHRB)

Minutes of May 29, 2015

Regular Board Members Present

K. Jones
M. Kennerly
T. Nicholson
S. Okerlund
R. Knoche
D. Schnoebelen
W. Weiss
R. Stutt
D. Miller
K. Mayberry
L. Roehl
R. Fangmann
T. Wipf

Alternate Board Members Present

D. Claman
C. Poole

Members with No Representation

P. Mouw

Secretary – V. Goetz

Visitors

Wayne Sunday	Iowa Department of Transportation
Tim Miner	Iowa Department of Transportation
Brooke Mitchell	Iowa Department of Transportation
Alex Kiebel	Iowa Department of Transportation
Francis Todey	Iowa Department of Transportation
Nicole Fox	Iowa Department of Transportation
Anuj Sharma	Iowa State University/InTrans
Brent Phares	Iowa State University/InTrans
Scott Schlorholtz	Iowa State University/InTrans
Neal Hawkins	Iowa State University/InTrans
Gordon Smith	ICPA
Lisa McDaniel	FHWA
Andy Wilson	FHWA

The meeting was held at the Iowa Department of Transportation Ames Complex, Materials East/West Conference Room, on Friday, May 29, 2015. The meeting was called to order at 9:00 a.m. by Chairperson Sarah Okerlund with an initial number of 11 voting members/alternates at the table.

1. **Agenda review/modification**

2. **Motion to approve Minutes from the April 24, 2015 meeting**

Motion to Approve by T. Wipf; 2nd D. Schnoebelen
Motion carried with 11 Aye, 0 Nay, 0 Abstaining.

*****1 member joined the table. Total voting members = 12.**

3. **FINAL REPORT, TR-628,** *"Alkali Content of Fly Ash: Measuring and Testing Strategies for Compliance", Scot Schlorholtz*, Iowa State University, ($156,091).

BACKGROUND

Sodium and potassium are the common alkalis present in fly ash. Excessive amounts of fly ash alkalis can cause efflorescence problems in concrete products and raise concern about the effectiveness of the fly ash to mitigate alkali-silica reaction (ASR). Fly ash marketing agencies occasionally provide materials that just miss the criteria for alkali content given in Iowa DOT IM 491.17. Since usage is only from an approved list (certified sources) this leads to disputes that can be difficult to resolve. This is especially problematic when the alkali content of a given source of fly ash only changes by a small amount, but the change causes the source to exceed a specification limit.

OBJECTIVES

The objectives of this research project were to:

- Determine if and how, new emission control rules will impact Midwest power plants and fly ash production
- Determine if high-alkali fly ash exacerbates the occurrence of ASR in laboratory test specimens
- Determine a faster method for determining the available alkali content of fly ash
- Evaluate field concrete containing high-alkali fly ash to see if ASR is more prevalent

Motion to Approve by K. Jones; 2nd R. Knoche
Motion carried with 12 Aye, 0 Nay, 0 Abstaining.

4. **PRESENTATION,** *"Implementation of a Pilot continuous Monitoring System: Iowa Falls Arch Bridge Evaluation", Brent Phares*, Iowa State University.

BACKGROUND

As part of designing, constructing, and maintaining the bridge infrastructure in Iowa, the Iowa Department of Transportation (DOT) has, in recent years, focused efforts on investigating the use of new high-performance materials, new design concepts and construction methods, and various new maintenance methods. These progressive efforts are intended to increase the lifespan of bridges in meeting the Iowa DOT objective of building and maintaining cost-effective and safe bridges.

Bridge testing and monitoring has been beneficial in helping with these innovative efforts, and in providing important information to evaluate the structural performance and safety of existing bridges. The Iowa DOT testing and monitoring program, in coordination with the Bridge Engineering Center (BEC) at Iowa State University, collects performance data to compare with design-based structural parameters to determine if the structural response is appropriate. The data may also be used to "calibrate" an analytical model that may be used to provide a more detailed structural assessment (e.g., a load rating to determine safe bridge capacity).

Diagnostic testing has also been used to help identify deterioration or damage or to assess the integrity of an implemented repair or strengthening method. In cases where the Iowa DOT has investigated the use of innovative materials (high-performance steel, ultra-high-performance concrete, fiber-reinforced polymers, etc.) and design/construction methods, they have used testing as part of a program for evaluating bridge performance.

OBJECTIVES

The goal of this work was to move SHM one step closer to being ready for mainstream use by the Iowa DOT Office of Bridges and Structures. To meet this goal, the objective of this project was to implement a pilot multi-sensor continuous monitoring system on the Iowa Falls Arch Bridge such that autonomous data analysis, storage, and retrieval can be demonstrated.

DISCUSSION

Q. Have we thought about running a heavy load across to calibrate the stresses and strain to get that upper limit?

A. Yes, once we set the limit.

Q. If we made it public, would the viewer's know where the sensors were and would this cause a new security risk?

A. Yes, we would have to put in security measures so only the people we would want to see it could.

Q. What is the intent of making it live to everyone?

A. Live actually means we would make it live to the Department of Transportation unless a certain community requested it.

Q. How is your data transmitted?

A. We transmit data through DSL Connection. In other remote sections we use 4G Cell Modems.

Q. On I-74 will the data be available to streamline in sections?

A. This is the goal. You don't want the data to interfere with everyday operation. The intent is to have it alert someone then to assist in the problem.

Q. Will the yearly inspections help offset some of the cost?

A. My long term vision would be yes, but that is long term.

Q. Are you aware of other State Agencies having this type of program?

A. There is some accounts that bridges are being monitored but they do not know what to do with the data received so this next step is a big step.

*****2 members joined the table. Total voting members = 14.**

5. **PROPOSAL,** *"Evaluation of Rural Intersection Treatments",* Neal Hawkins, Iowa State University, ($80,000).

BACKGROUND

Various intersection treatments, such overhead flashing beacons, have been used to alert drivers to the presence of an intersection but the effectiveness of the various treatments is not well documented.

Overhead Beacons

Overhead beacons have been widely used to warn drivers that an upcoming intersection is present. Overhead beacons also remind drivers of who has the right of way. In general overhead beacons have shown mixed results.

Several studies have found the overhead beacons to be effective. Brewer and Fitzpatrick (2004) evaluated four intersections in Texas where flashing overhead beacons were installed and found that the crash rate was reduced by 43% from the period of three years before to three years after the improvement was installed. Stackhouse and Cassidy (1996) analyzed crash data at eight rural intersections of Minnesota for three years before and after period of installation of overhead beacons. All were four-way with stop control on the minor approaches. A simple crash analysis indicated a 39% reduction in crashes. Murphy and Hummer (2007) developed crash reduction factors for overhead flashing beacons at 34 four-leg two-way stop-controlled rural intersections in North Carolina.

OBJECTIVES

The main benefit of the research is better information in the short term, on the effectiveness of the selected countermeasures, which can guide future investments. Results from this project can more effectively target future deployments to better address safety. Benefits can be measured in changes to the measures of effectiveness (MOEs) which will be used to assess impact of the countermeasures based on before and after installation conditions.
Information from the research will provide additional information for agencies to select treatments for problematic rural intersections.

DISCUSSION

Q. Would a rural intersection include a State Highway or will you just look at rural intersections?
A. At first we will be looking at crash sites and then the intersection. We will then take this to the TAC and look at the characteristics of these sites.
Q. The units themselves that are mounted on the signs that activate when the lights go on or off, is there any opportunity to collect data from those units?
A. We have put in signs with some Federal Highway projects were you can collect data for three months which is good but the signs we are looking at and devices do not have the power to record on site.

Motion to Approve by D. Miller; 2nd R. Knoche
Motion carried with Aye, 14 Nay, 0 Abstaining, 0.

6. **PROPOSAL,** *"Installation Guidance for Centerline and Edgeline Rumble Strips in Narrow Pavements", Peter Savolainen, Iowa State University, ($60,000).*

BACKGROUND

Lane departure crashes, which occur when a vehicle crosses the edge line or centerline of the roadway, result in nearly 17,000 fatalities annually throughout the United States, comprising a majority of all fatal crashes (*NHTSA, 2014*). Lane departure crashes are a particular concern on high-speed undivided highways, which are more susceptible to cross-centerline crashes, including head-on and opposite-direction sideswipe collisions. Centerline rumble strips (CLRS) and shoulder rumble strips (SRS) are a common countermeasure to reduce lane departure crashes, providing a tactile and audible alert to motorists who drift out of their intended travel lanes. A 2011 state-of-the-practice survey found that at least 36 states in the US had implemented CLRS, covering more than 11,000 roadway miles (*Karkle et al., 2013*). Several prior evaluations have assessed the safety performance of CLRS and SRS on high-speed non-freeway facilities. An early evaluation of CLRS installations along 210 miles of two-lane highways across seven states showed a 14-percent reduction in total injury crashes and a 25-percent reduction in head-on and opposite-direction sideswipe injury crashes (*Persaud et al., 2003*). Similar results were observed in subsequent evaluations of CLRS on two-lane rural roadways, including a study in British Columbia, Canada that found reductions in run-off-the-road-left and head-on collisions of 29.3 percent (*Sayed et al., 2010*), and a Kansas study that found a 29-percent reduction in correctable cross-centerline crashes (*Karkle et al., 2013*). *NCHRP Report 641* provides an extensive evaluation of the safety impacts of CLRS, including data from extensive CLRS implementations in Minnesota, Pennsylvania, and Washington (*Torbic et al., 2009*). Head-on and opposite-direction sideswipe collisions were reduced by 37.0 percent and 44.5 percent, respectively, while total crashes and injury or fatal crashes were reduced by 4.1 percent and 9.4 percent, respectively. Crash reductions were shown to be particularly pronounced on horizontal curves.
A recent Michigan study shows CLRS to reduce total crashes by 15.8 to 17.2 percent and fatal target (i.e., cross-centerline) crashes by 44.2 to 51.4 percent as shown in Table 1 (*Kay et al., 2015*). Interestingly, these reductions were most pronounced when SRS were used in combination with CLRS, even when focusing only on centerline-related crashes.

This finding is consistent with recent behavioral research, which has shown improvements in vehicular lateral position due to CLRS to be larger on curves as opposed to tangent sections (*Gates et al., 2012*) as shown in Table 2. CLRS have also been shown to elicit more centralized vehicular lane positioning – an effect that is even more pronounced when SRS are used in combination with CLRS.

Ultimately, these data suggest that rumble strips result in fundamental differences in driver behavior, which ultimately help lead to reductions in lane departure crashes. However, it is unclear whether CLRS, SRS, or a combination of the two treatments is most effective on narrower pavements.

OBJECTIVES

Rumble strips (CLRS) and shoulder rumble strips (SRS) in narrow pavements. It is anticipated that the first step in this research would be the determination of a minimum "rumble-free" lane width that is tolerable for a majority of road users.
This width could then be used to develop a matrix of rumble strip options for a range of narrow pavement widths. It is expected that the appropriate combination and width of centerline and/or edge line rumble strips to install on a location-specific basis might then depend on site conditions such as:

- Traffic volumes
- Shoulder width

• Roadside hazard rating
• Roadway alignment
• Presence of bicyclists

<u>DISCUSSION</u>
Q. There are a lot of resistances to having types of treatments placed on curved roads where homes are and narrow shoulders. Will this be considered when making your decision?
A. When choosing the sites we will be including several variables especially public surveys.

Motion to Approve by R. Fangmann; 2nd K. Mayberry
Motion carried with Aye, 14 Nay, 0 Abstaining, 0.

7. **STIC Review and Call for STIC Incentive Funds**
   The IHRB serves as The Statewide Transportation Innovation Council for the State of Iowa. We are able to set the direction not only for projects that would be funded for STIC but also to foster innovation in the State and to have one place we can have communication with our Federal Highway Administration. There were several representatives from each State that met last fall in Louisville, KY and talked about Every Day Counts initiatives round three. This was recently published and came up with an Implementation plan for Iowa. There is currently a call out for projects to be funded with STIC dollars and the board will review these topics at the June meeting.

8. **New Business**

9. **Adjourn**

The next meeting of the Iowa Highway Research Board will be held Friday, June 26, 2015, in the East/West Materials Conference Room at the Iowa DOT. The meeting will begin promptly at 9 a.m.

Vanessa Goetz, IHRB Secretary